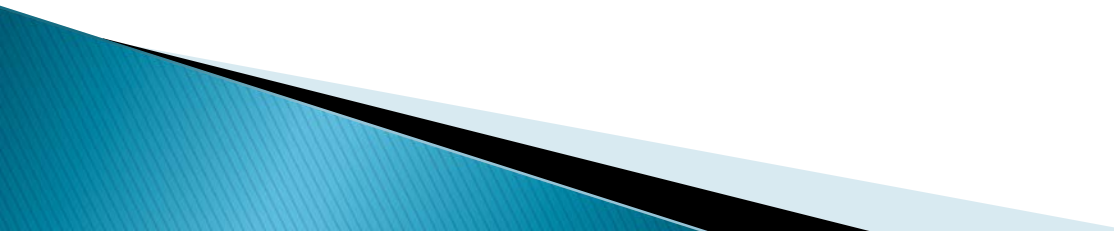


Fire Safety In the OR

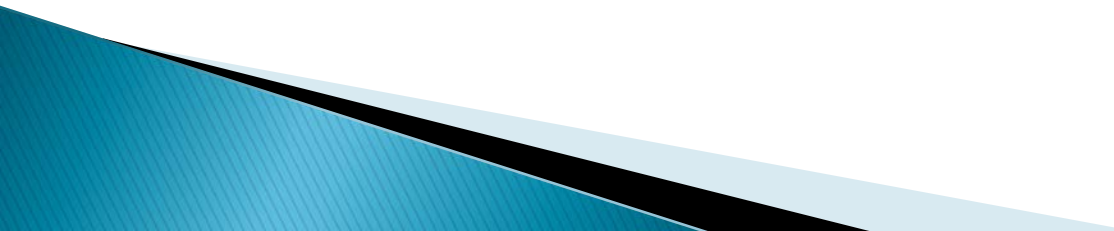
Review and Prevention of Airway Fires in the
Peri-Operative Setting

By Joyce Freeman, B.S., Cer.A.T.

Objectives:

- ▶ This education will include:
 - ▶ 1. Describing the Fire Triad.
 - ▶ 2. Location of fire extinguishers and exit routes.
 - ▶ 3. Role of surgeons, anesthesiologists, nurses and technicians
 - ▶ 4. Discussion on a airway fire scenario.
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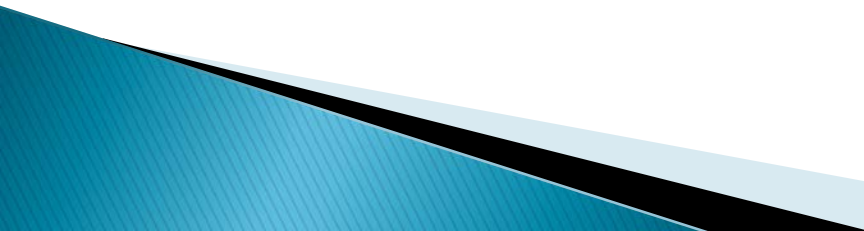
Fire Safety In the OR

- ▶ Fires in the OR setting are recognized more now, with an emphasis to pay closer attention to education.
 - ▶ Between 50 and 200 fires occur in the operating with 20% resulting in serious injury or death.
- 

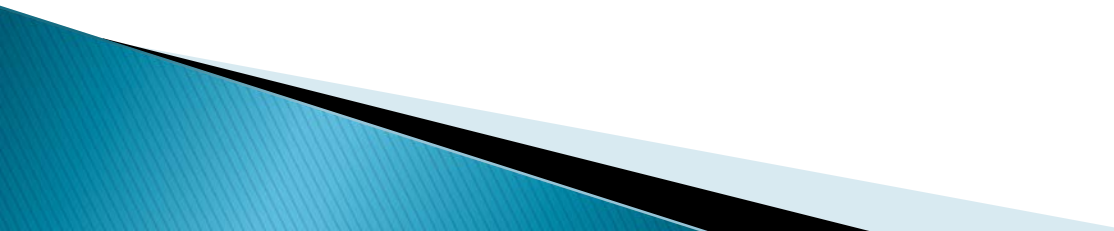
ASA Closed Claims Database

- ▶ 2% of claims are related to burns
- ▶ 1 death reported was related to a laser burn of the airway.
- ▶ 2 airway fires resulted in permanent disabling injuries.
- ▶ Payment resulted more in burn claims, 72%.
- ▶ Airway cases most serve with highest payout and were paid 100% of the time.

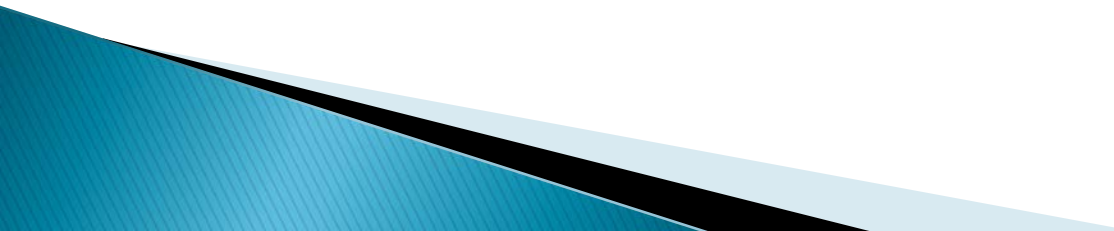
Advisory Statement

- ▶ “Anesthesiologists and Surgeons should periodically participate in OR fire drills with the entire OR team. This formal rehearsal should take place during dedicated educational time, not during patient care”.
 - ▶ Upstate performs a yearly OR Fire Drill rotating between 5 East, 3 North , and Upstate Outpatient Center. Future drills will also include Upstate Community Hospital.
- 

Fire In The OR: Anesthesiology

- ▶ The following slides will focus on:
 - Preparation, Prevention and Management of an Airway Fire.
 - What to do if an anesthesia airway fire occurs.
- 


Preparation

- ▶ Anesthesiologists and surgeons should participate as part of the entire OR team to assess the risks associated with each patient.
 - ▶ The team members will agree on how an OR fire will be prevented.
 - ▶ Who should be in charge in the event a fire occurs: surgeon or anesthesiologist?
 - ▶ Some institutions have a time out to assess the risks involved ensuring that all fire prevention precautions are in place.
 - ▶ Have at least one bottle of saline or water on the anesthesia cart in case of fire, several is better.
- 

Preparation Continued

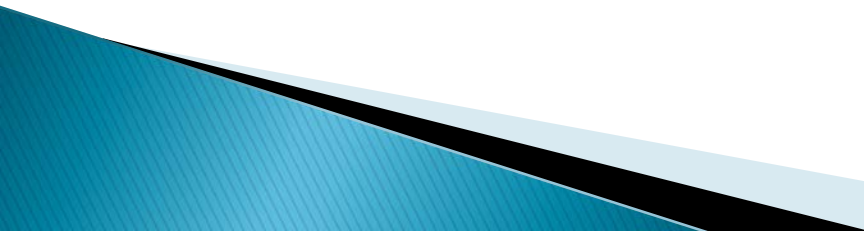
- ▶ Ensure that the correct ET tube is used for the Correct procedure. Laser tube vs standard tube.
- ▶ Laser Surgery: Laser ET tubes should be filled with saline rather than air.
 - Fill laser tube with tinted saline to act as a marker for cuff puncture by laser. Methylene blue is recommended.

Procedures with High Risk for Fires

- ▶ **Oropharyngeal Surgery:** Tonsillectomy and Adenotonsillectomy
 - ▶ **Facial Surgery:** Removal of lesions on head, face, or neck
 - ▶ **Endoscopic Laser Surgery:** Removal of laryngeal papillomas
 - ▶ **Cutaneous/ Transcutaneous Surgery**
 - ▶ **Tracheostomy and Burr Hole Surgery**
- 

New Considerations for Preventing Surgical Fires

Control the oxygen concentration in the field.

1. For patients sedated for procedures above the xiphoid process, the recommendations are:
 - A. Patient should breath room air.
 - B. Administering O₂ should be limited to 30%, ensuring that hypoxia doesn't set in.
 - C. If greater than 30% inspired O₂ is needed to prevent hypoxia then expel the oxygen from the surgical field.
- 

New Considerations continued

Other types of patients to keep in mind when greater amounts of O₂ are required:

- ▶ Pacemaker Insertion in fragile patients
- ▶ Patients who are O₂ dependent and need to be responsive.
 - ✓ Carotid Endarterectomy
 - ✓ Awake Craniotomy

Review of Fire Triad

Oxidizer: Oxygen & nitrous oxide. Oxidizer enriched atmosphere exists within a closed or semi-closed breathing system, including patient's airway. Masks, nasal cannulas can promote the pooling of oxygen or mixture of oxygen and nitrous oxide.

Ignition Source: Electrocautery, Lasers, drills, burrs, argon beams, fiberoptic lights to name a few.

Fuel Source: Sponges, drapes, gauze, alcohol containing solutions (prep solutions), chlorhexidine, volatile compounds such as ether or acetone, oxygen masks, nasal cannulae, patient's hair, flexible endoscopes, and gowns can be a fuel source. *Potentially you can become a fuel source, the gowns being worn by the surgical team, and or your sleeve.*

Fire Triad

- ▶ Keep the patient safe

When these three elements combine, the results may be a surgical fire.

Sources:

Circulation/Scrub
scrubs
gowns
skin prep

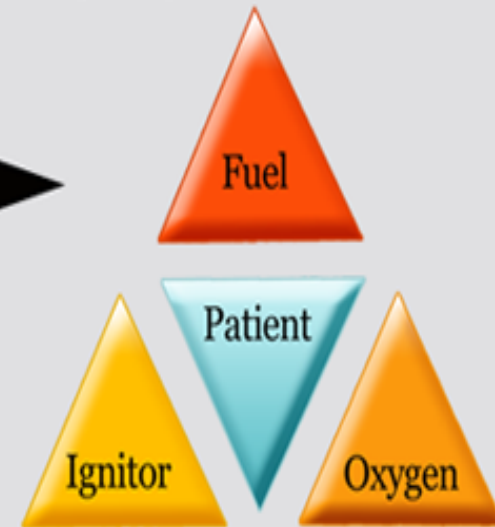
Sources:

Surgeon
cautery tool
light sources
laser



Sources:
Anesthesia
oxidizers

Managing the elements safely, reduces the likelihood of fire and keeps the patient in the safe zone.




Source: Memorial
Medical Center

Ignition Source

- ▶ Electrosurgical unit
 - ▶ Argon beam coagulator
 - ▶ Power tools (e.g. drills, burrs)
 - ▶ Laser
 - ▶ Fiber optic light
 - ▶ Defibrillator
 - ▶ Electrical equipment
- ▶ Source: AORN

Ignition Source (continued)

- ▶ Inspect electrical cords and plugs for integrity and remove from service if broken
 - ▶ Check biomedical inspection stickers on equipment for a current inspection date and remove from service if not current
 - ▶ Use a laser-resistant endotracheal tube when using laser during upper airway procedures
 - ▶ Source: AORN
- 

Ignition Source (continued)

- ▶ Place wet sponges around the tube cuff if operating in close proximity to the endotracheal tube
- ▶ Use wet sponges or towels around the surgical site
- ▶ Only the person controlling the laser beam activates the laser
- ▶ Have water and the appropriate type fire extinguisher available

▶ Source: AORN

Oxidizers

- ▶ Oxygen
- ▶ Oxygen enriched environment
- ▶ Nitrous oxide

▶ Source: AORN



Oxidizer Safety Tips

- ▶ Inflate endotracheal tube cuff with tinted saline
- ▶ Evacuate surgical smoke from small or enclosed spaces
- ▶ Pack wet sponges around the back of the throat
- ▶ If O₂ is being used, suction the oropharynx deeply before using ignition source
- ▶ Check anesthesia circuits for possible leaks
- ▶ Turn off O₂ at end of each procedure
 - ▶ Source: AORN

Oxidizer Safety Tips (continued)

- ▶ Arrange drapes to create free air flow, avoid pocketing to avoid O₂ pooling.
- ▶ Keep oxygen percentage as low as possible
- ▶ Deliver 5 L to 10 L/min of air under drapes
- ▶ If >30% concentration required, intubate, or use laryngeal mask airway
- ▶ Stop supplemental O₂ or nitrous oxide 1 min. before using ignition source
- ▶ Use an adhesive incise drape

▶ Source: AORN



Fuel Source

- ▶ Patient
 - ▶ Personnel
 - ▶ Drapes
 - ▶ Gowns
 - ▶ Towels
 - ▶ Sponges
 - ▶ Dressings
 - ▶ Source: AORN
- ▶ Linens
 - ▶ Head coverings
 - ▶ Shoe covers
 - ▶ Collodion
 - ▶ Alcohol-based skin preparations
 - ▶ Human hair
 - ▶ Endotracheal tubes
 - ▶ Tapes

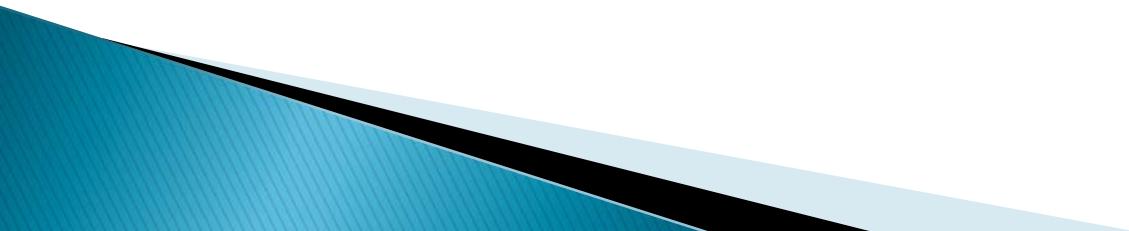
Fuel Source Safety Tips

- ▶ Use moist towels around the surgical site when using a laser
- ▶ During throat surgery, use moist sponges as packing in the throat
- ▶ Use water-based ointment and not oil-based ointment in facial hair and other hair near the surgical site
- ▶ Source: AORN


Fuel Source Tips (continued):

- ▶ Allow skin–prep agents to dry and fumes to dissipate before draping.
- ▶ Allow chemicals (e.g., alcohol, collodion, tinctures) to dry.
- ▶ “ChloraPrep” and “DurapPrep” are alcohol based; both require a drying time of a minimum of 3 minutes on hairless skin.
- ▶ Always avoid wetting the hair, drying time increases to a minimum drying time of least 1 hour.
- ▶ Always follow the manufactures instruction on fire safety that is located on the package.
- ▶ Conduct a skin prep “time out”

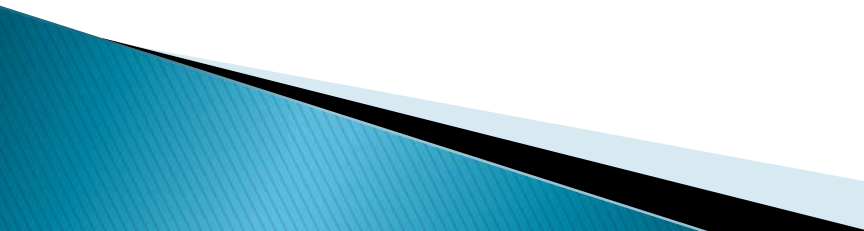
Management of Airway Fire



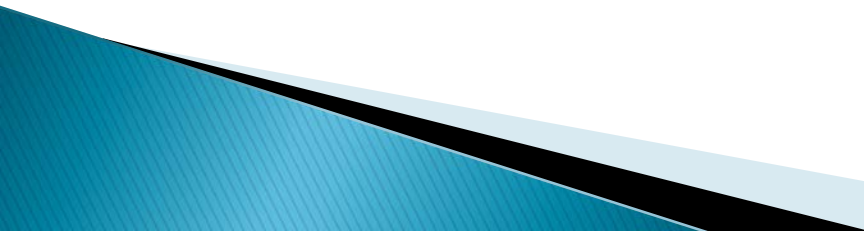
Responding to Fire: Surgeons

- ▶ Immediately initiate a predetermined sequence of responses
 - ▶ Nurse: Call for assistance
 - ▶ Each team member should immediately respond without waiting for others to react.
 - ▶ Surgical team should remove all drapes from patient. Use sterile water or saline to put out any fires associated with patient.
- 

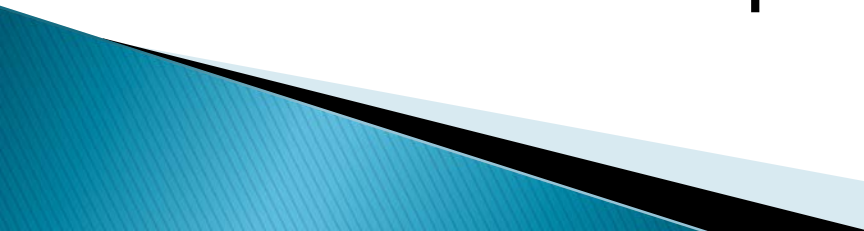
Airway/Circuit Fire: Anesthesiologists

- ▶ Call for assistance: Anesthesia technician
 - ▶ Extinguish the ET tube fire and remove the ET tube.
 - ▶ Stop the flow of airway gases: Oxygen and Nitrous oxide 1st.
 - ▶ Remove all flammable and burning materials from the airway.
 - ▶ Pour saline or water into the patient's airway.
- 


Airway Assessment: Fire is Out

- ▶ No need to remove patient from OR suite
 - ▶ Ventilation should be re-established
 - ▶ Oxygen and Nitrous oxide should not be used
 - ▶ ET tube should be examined to assess whether fragments are left in airway
 - ▶ Rigid bronchoscopy performed to assess thermal injury.
 - ▶ Flexible scope could possibly restart fire.
- 

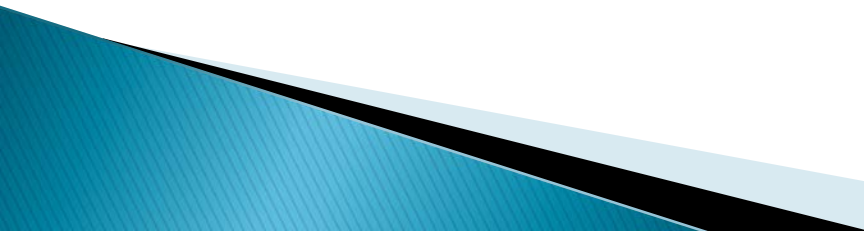
Fire is not extinguished after 1st Attempt: Non Airway Fire

- ▶ CO2 fire extinguisher should be used; if not successful then...
 - ▶ Activate fire alarm
 - ▶ Evacuate the patient following institutional protocols
 - ▶ Close door to room to contain fire
 - ▶ Turn off medical gas supply to room
 - ▶ Do not attempt to re-enter the room.
- 

Conclusion:

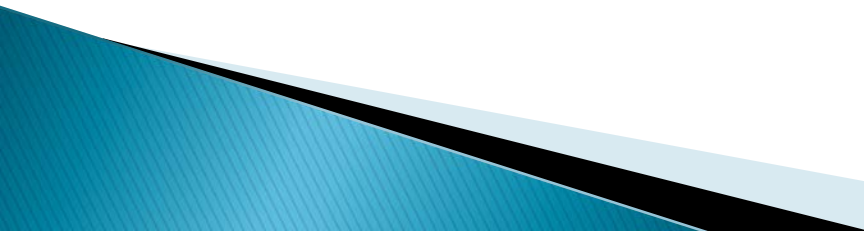
- ▶ Communication between the surgeon and the anesthesia care providers is vital when high risks procedures are being performed.
 - ▶ Be prepared in the event a fire does occur.
 - ▶ Know and understand OR policy at Upstate.
 - ▶ Know closest evacuation routes in the event that the fire is not manageable.
- 

Fire Extinguishers and Classes

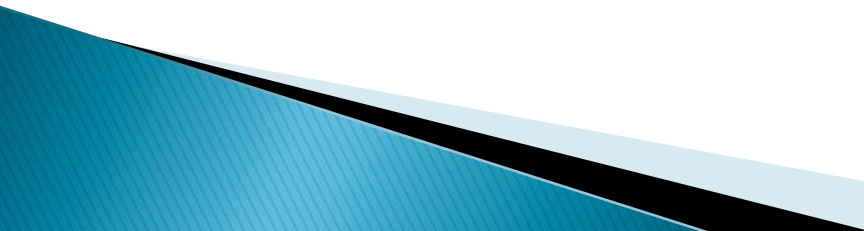
- ▶ Class A: Ordinary Combustible Material
 - ▶ Class B: Flammable liquids or grease
 - ▶ Class C: Energized Electrical Equipment
 - ▶ Class D: Combustible Metals
 - ▶ Class K: Combustible cooking oils and grease
- 

Fire Classes continued

Approved coverage for fire extinguishers for use in fires in the OR:

- Air pressurized water: Class A
 - Dry Chemical: Class B and C
 - CO2: Class B, C, and limited A
 - Multi-Purpose dry chemical: Class A, B, and C
- 

Fire Safety in the OR

- ▶ A CO2 fire extinguisher should be used.
 - ▶ If the CO2 fire extinguisher is not successful both groups agree that the fire station should be pulled.
 - ▶ Upstate policy mandates that if a fire occurs, a Code Red is initiated.
- 

Dry Chemical Fire Extinguisher



Fire Extinguisher



5 East: Location of Pull Stations

Pull Stations are located

- ▶ Across from the 5 East OR desk
- ▶ Back hallway by room 12
- ▶ Outside the 5 East lounge
- ▶ PACU.



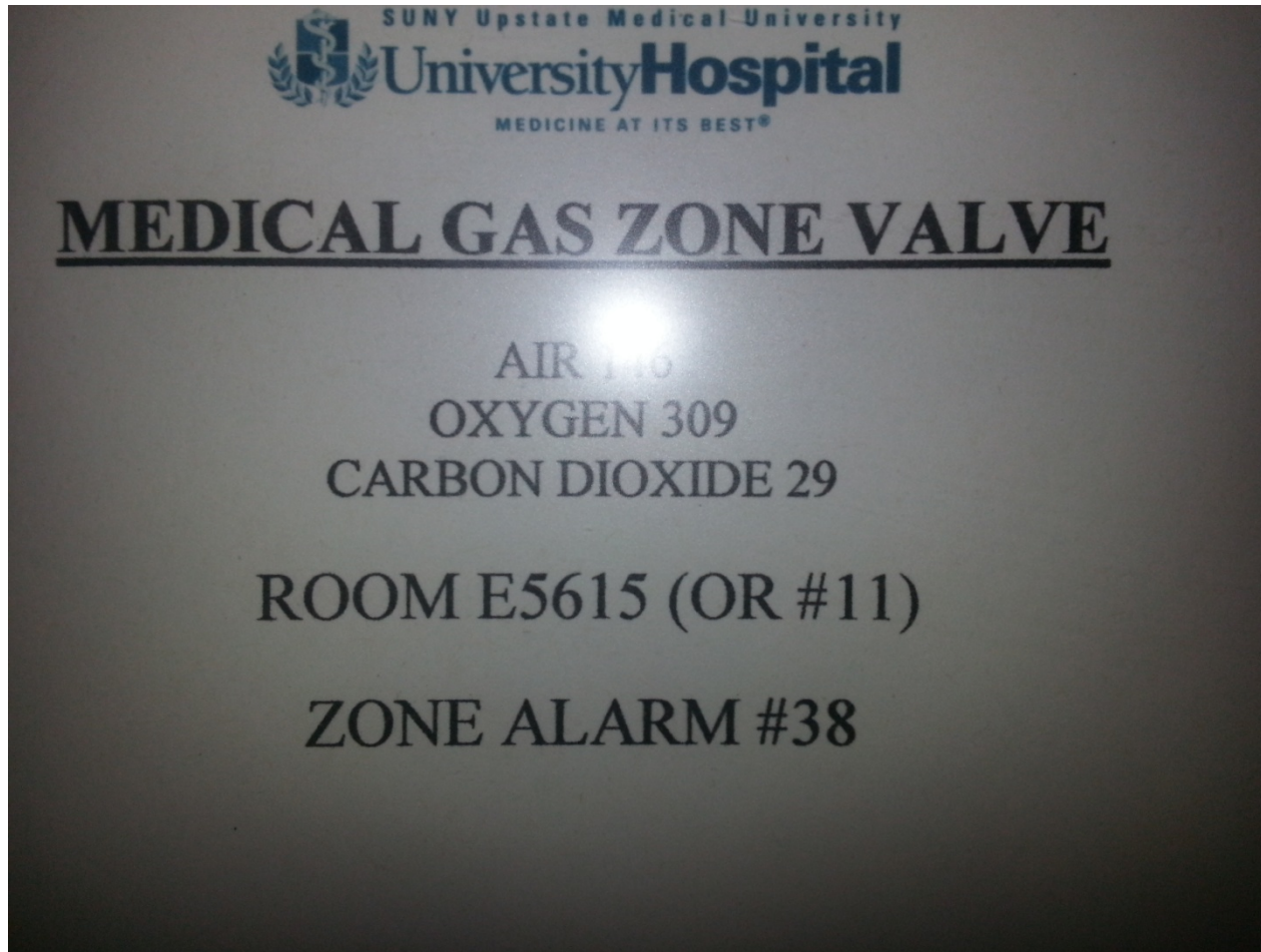
3 North: Location of Pull Stations

Pull Stations are located

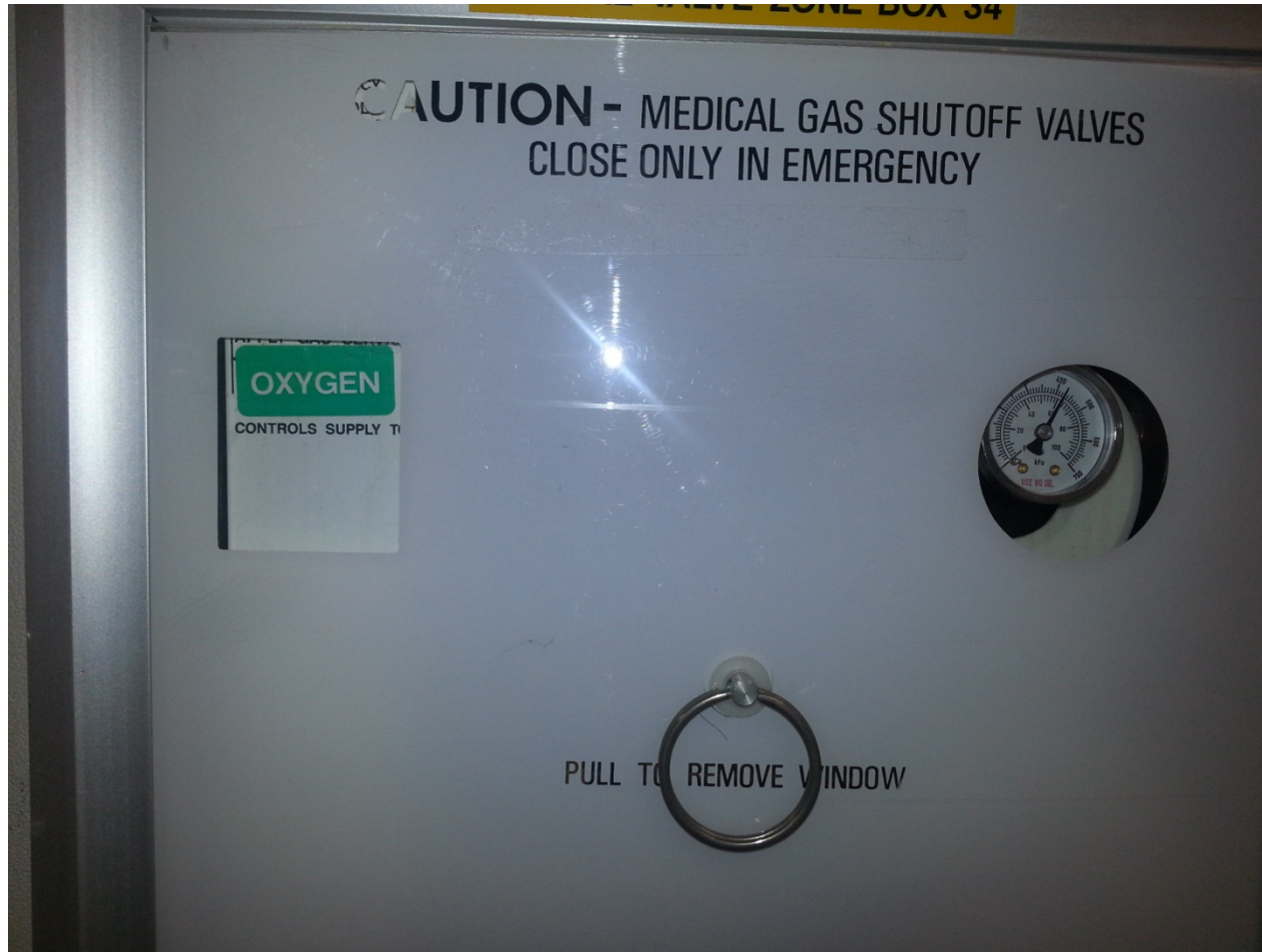
- ▶ One at the beginning of each hallway
- ▶ One by room 4.



Medical Pipeline Zones



Room Pipeline Shut Off Cover




Room Pipeline Shut Off



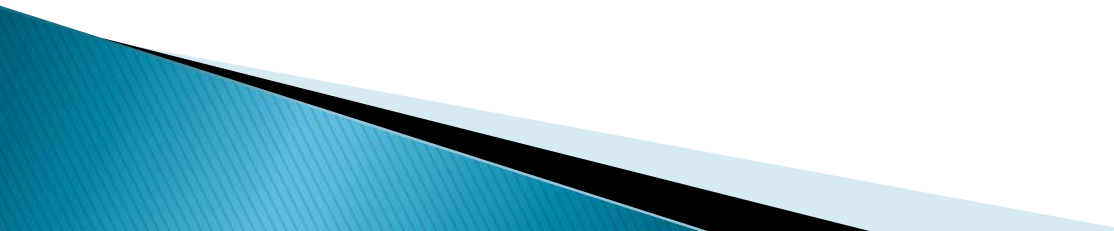
APSF: Fire Safety Video

Please view this 18 minute [Anesthesia Patient Safety Foundation video](#).

Review for Operating Room Personnel:

- ▶ Do you know who the triad members of the team are?
 - ▶ Do you need more personnel for assistance; Operating Room or Anesthesiology?
 - ▶ Do you need to have the O2 turned off to the room, including flow meters? Who makes this call: Anesthesiologist
 - ▶ Does the anesthesia machine need to be taken out of service?
 - ▶ Is there any electrical equipment for the surgeon that needs to be discontinued?
- 

Important Considerations:

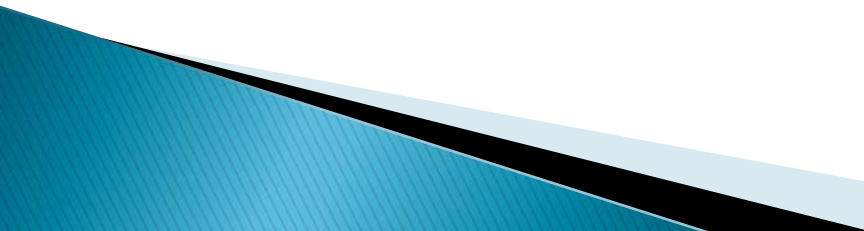
- ▶ How badly is the patient burned?
 - ▶ Is this now considered a crime scene?
- 

Important Considerations

The OR space after the event:

- ▶ Once the patient is safe and no longer in danger:
 - The room must remain as is. Nothing can be cleaned or removed.
 - All evidence must be preserved. Evidence is needed to complete fire investigations by the Fire Marshal for state reporting, Syracuse Fire Department incident reporting , criminal and/or legal investigations as well as internal assessments of equipment and/or failures.
 - Forensics may need to take pictures.

Upstate Medical University

- ▶ Emergency phone for fire: 4-5555
 - ▶ Hospital Fire Policy: (FO1) Fire Safety Procedures
 - ▶ Upstate Outpatient Surgery Center Fire Policy: (Oper UO2)
- 

References

- ▶ Anesthesiology, V 108, No 5, May 2008, Consultant Survey Responses.
- ▶ Anesthesiology News, “Management of the Patient at Risk for an Operating Room Fire”, October 2013
- ▶ Power Point, AORN
- ▶ Jeffrey M. Feldman, MD, MSE, Jan Ehrenwerth, MD, and Richard P. Dutton, Md. “Thinking Outside the Triangle: A New Approach to Preventing Surgical Fires”, April 2014. Volume 118. Number 4
- ▶ Pictures and documentation by Joyce Freeman, BS Health Care Management, Cer.A.T., January 2014
- ▶ Elizabeth Frost, M.D. Drug Safety: “Letting Some Light into the Black Hole of the OR:”, 2nd Annual Anesthesia Tech Continuing Education Lecture Series, December, 2014
- ▶ Contributor: Fire Marshal William MacDonald
- ▶ Produced by: Joyce M. Freeman, BS., Cer.A.T.